The effects of spatial mobility on the performance of firms

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The Effects of Spatial Mobility on the Performance of Firms

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abstract

A considerable body of research has analyzed the impact of a firm's geographic position and levels of organizational and territorial embeddedness on its performance. Generally, these studies have assumed that firms are immobile. Research that has focused on the effects of the relocation of firms has treated firms mainly as atomistic actors that can move freely in geographic space and has tended to neglect the influence of changes in a firm's geographic position and level of organizational and territorial embeddedness. We integrated insights from both streams of literature to answer the research question, "What are the effects of relocation on a firm's performance, and what is the influence of a firm's geographic position and its level of organizational and territorial embeddedness on this relationship?" On the basis of our analysis of data from a survey of managers of Dutch automation services firms, we found that the degree of impact of a firm's relocation on its performance depends on the characteristics of the relocation. For example, a move to an urbanized region hampers performance, whereas a move to a research and development-intensive region fosters a higher level of performance. Furthermore, firms with high levels of organizational embeddedness suffer in the short term from relocation, but benefit in the long run.

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A considerable body of research has analyzed the impact of a firm's geographic location and level of embeddedness on its performance. These studies have commonly defined *organizational embeddedness* as the structure and quality of ties among firms (Uzzi 1996) and *territorial embeddedness* as the extent to which ties among firms are localized (Hess 2004). Even though the number of firms that have relocated has grown steadily and considerably, this literature has generally assumed that firms are immobile (van Dijk and Pellenbarg 2000). The research that has focused on the effects of a firm's relocation on its performance has tended to treat firms as atomistic, unconnected actors. This emphasis is remarkable, given that two key determinants of a firm's performance—a firm's geographic position and its levels of organizational and territorial embeddedness—are likely to be altered by relocation (Pettigrew and Massini 2003; Knoben and Oerlemans forthcoming).

Both strands of research are relevant for studying the effects of relocation on a firm's performance, but are disconnected. In our study, we integrated both streams of literature to generate a more complete and reliable explanation of the relationship between relocation and a firm's performance.[1] To do so, we focused on the following research question, "What are the effects of relocation on a firm's performance, and what is the influence of a firm's geographic position and level of organizational and territorial embeddedness on this relationship?"[2]

We begin with a discussion of our conceptual approach. In the second section, we argue that to gain a full understanding of the effects of relocation on a firm's performance, one must first understand how a firm's geographic position and levels of organizational and territorial embeddedness influence its performance and how these characteristics are likely to be affected

[1] The research presented here is part of a larger study on the causes and consequences of firms' relocations. Whereas Knoben and Oerlemans (forthcoming) analyzed the causes of relocation, this article focuses on the consequences of firms' relocations.

[2] It should be noted that, technically, the term *firm relocation* can only be used for single-site firms. In all other cases, the term *establishment relocation* should be used. However, given the prevalent use of *firm relocation* in the literature, we use this term in this article to refer to both single-site firms and a single establishment of a multisite firm. Given the fact that it is likely that these two entities experience different effects of relocation, we distinguish between single-establishment firms and establishments that are part of a multisite firm in the empirical analyses.

by a relocation. In the third section, we explore in more detail the effects of relocation on a firm's performance and present our hypotheses. Measurement and methodological issues are covered in the fourth section, and the results of the analyses are presented in the fifth section. In the final section, we discuss the implications of our results and the limitations of the study.

Conceptual Approach

The first step in determining the effects of relocation on a firm's performance is to look at how any firm's environment, here defined as a set of external resources, influences its performance. The extended resource-based view of a firm (Dyer and Singh 1998; Lavie 2006) is a highly applicable conceptual approach because it takes into account the importance to a firm's performance of both internal and external resources. Moreover, this conceptual approach is closely linked to the evolutionary competence-based perspective of the firm, which is highly applicable in the context of economic geography (Maskell 2001; Taylor and Asheim 2001). The next step is to look at how relocation affects that environment and how those changes are likely to affect the firm's performance. In this case, (re)location theory is appropriate, since it explains why firms relocate and which factors play a role in their decision to do so. We used these conceptual approaches to develop a systematic line of reasoning regarding the effects of relocation on the performance of firms and then to develop testable hypotheses.

The Resource-Based View of the Firm

At the core of the resource-based view of the firm is the notion that the resources and capabilities that a firm control's are the determinants of the firm's subsequent performance and so are the key to why some firms outperform others (Barney and Hesterly 1999). Two critical assumptions underlie this reasoning: (1) resource heterogeneity, namely, that the characteristics of resources and capabilities can vary significantly from firm to firm; and (2) imperfect resource mobility, namely, that these differences can be relatively stable over time and space (Barney 1991). Resources are regularly classified as physical, human, and organizational capital (Barney 1991). Physical capital includes the technology used by a firm, its plant, equipment, and location. Human capital is primarily the education, expertise, and experience of employees and managers. Organizational capital refers to the unique systems and processes that a firm uses in its investment, production, and sales activities (Lev and Radhakrishnan 2005).

Originally, the resource-based view focused primarily on the internal resources of a firm and how they affect a firm's market performance. However, with increased globalization, firms concentrate more intensely on their core activities and outsource many others. As a result, the resource-based view has shifted to include both internal and external resource bases (Pettigrew and Massini 2003). Often firms cannot muster all the resources they need alone. This being the case, their geographic position and relationships with other organizations are crucial to obtaining resources and, in the end, to their performance. In including external resources, the resource-based view borrows heavily from other theoretical approaches, such as resource dependence theory, transaction costs economics, and agglomeration theory.

Wiewel and Hunter (1985) effectively drew on the agglomeration literature and location theory when they argued that physical proximity facilitates the exchange of resources, legitimacy building, and access to skilled labor (Maskell 2001). Moreover, the notion of organizational capital has been explicitly linked to the literature on interorganizational networks, which has examined a firm's interorganizational relationships and networks,

that is, a firm's organizational embeddedness (Dyer and Singh 1998; Lavie 2006). The importance of organizational embeddedness is based on the idea that firms can overcome resource-based constraints by pooling and sharing their complementary resources and collaboratively performing tasks that neither of them could perform alone (Combs and Ketchen 1999; Dyer 1996).

The growing importance of organizational embeddedness has led to the development of another concept, territorial embeddedness, because the success of (knowledge-intensive) interorganizational collaboration, it is often argued, hinges on geographic proximity (Gallaud and Torre 2004). The crux of the argument is that close proximity fosters good informational contacts and facilitates the exchange of resources among actors, especially tacit ones (Gertler 2003). It could be argued that it is not organizational embeddedness per se, but territorial embeddedness, that is, localized organizational embeddedness (Hess 2004), that facilitates access to unique resources that can enhance performance.

Different groups of resources that are important to a firm's performance can be identified: (1) a firm's internal resources, (2) resources generated by the firm's organizational and territorial embeddedness, and (3) resources stemming from the firm's geographical position. When a firm relocates, some impact on the latter two groups of resources is likely. Successful interorganizational relationships require stability (Ahuja 2000), and relocations inevitably lead to a period of organizational instability (Isabella 1990). Territorial embeddedness is, by definition, tied to a certain location (Hess 2004) and is therefore likely to be affected by relocation. Finally, even though the distance between the new location and the previous location may not be great, the firm's geographic position has obviously changed. We look at these points in more detail in the third section.

Because the geographic position of a firm and the firm's level of organizational and territorial embeddedness together are the conduit to valuable resources, it is surprising that no study has addressed spatial mobility as a means of gaining better access to external valuable resources. Indeed, this is a promising area of research, since the resource-based view of the firm argues that access to, and the development of, resources are highly path dependent (Arthur, Ermolieve, and Kaniovsky 1987). It is likely that relocation acts as a significant deviation from the historical path and therefore has considerable implications for access to, and the development of, resources.

Firm Relocation

The dominant (re)location theories predict that once a firm has chosen an initial location, it will relocate only if it is no longer profitable at that location (behavioral theory) or its current location is no longer optimal (neoclassical theory). More recently, evolutionary (re)location theories have been proposed that take into account the fact that firms can also make "opportunity-driven" relocations, to be closer to a potential market, for example, and that firms must be both willing and able to relocate (Stam 2007). Nevertheless, even according to these perspectives, relocation would lead to a better fit between the firm and its new location and, therefore, to higher levels of performance.

According to most of these theories, firms are atomistic actors that move in geographic space without regard for the relationship between them and other organizations (for some exceptions, see Stam 2007; Knoben and Oerlemans forthcoming). This omission is striking because, as we have already argued, these relationships are becoming more important for the performance of firms (see, e.g., Owen-Smith and Powell 2004; Ahuja 2000). It seems plausible that synergistic benefits can be obtained by combining insights from both perspectives. To realize such synergistic benefits, we used insights from both theoretical

perspectives to develop a theoretical framework that explains the effects of relocation on a firm's performance.

Determinants of the Effects of Relocation on the Performance of Firms

The impact of the use of different resources on a firm's performance and how relocation influences this relationship are discussed in more detail below. For brevity and clarity, the hypotheses that are presented in this section are summarized in Table 1.

Internal Resources

The strength of the internal resource base of a firm is often related to the performance of a firm and is generally seen as one of the most important predictors of a firm's performance (Sternberg and Arndt 2001). The main focus is on the assets that positively distinguish one firm from others, that is, the firm's unique resources (Maskell 2001). Firms achieve sustained enhanced performance primarily by implementing strategies that exploit these unique resource endowments (Barney 1991). Since internal resources are both owned and controlled by the firm in question, they provide a base for sustained enhanced performance that other firms may find difficult to match. Therefore, we propose a positive relationship between the strength of a firm's internal resource base and the firm's performance.

Table 1

Overview of Hypotheses

Hypotheses		Hypothesized Effect
Internal resource base		
1	Strength of the internal resource base	+
Organizational embeddedness		
2	Number of interorganizational relationships (IORs)	+
3	Strength of ties	+
4	Technological proximity	∩
Territorial embeddedness		
5	Localization of the network	+
Geographic position		
6	Level of urbanization of the region	+
7	Level of localization of the region	+
8	R&D intensity of the region	+
Consequences of firm relocation		
9a	Relocation on short-term effects	–
9b	Relocation on medium- and long-term effects	+
10	Distance of relocation	–
11a	Direction of relocation (urbanized to rural)	–
11b	Direction of relocation (localized to nonlocalized)	
11c	Direction of relocation (high to low R&D intensity)	–
11d	Direction of relocation (away from main partners)	–
Effects of relocation moderated by		
12	Amount of IORs of the relocating firm	Stronger
13a	Localization of the firm's network	Stronger
13b	Strength of IORs	Stronger
13c	Level of organizational proximity	Weaker

Organizational Embeddedness

A firm's participation in interorganizational relationships and networks, and thereby its access to external resources controlled by other organizations, is at the root of organizational embeddedness (Granovetter 1985), sometimes referred to as network embeddedness (Hess 2004). Granovetter (1985) argued that an actor's level of organizational embeddedness is determined both by its position in the overall interorganizational network (e.g., the extent to which an actor is centrally positioned) and by the characteristics of its relationships (e.g., whether these relationships are strong or weak). Thus, the impact of both dimensions of a firm's level of organizational embeddedness has to be taken into account.

A firm's position in a network determines which resources the firm has access to and the extent to which the firm can influence the behavior of other actors in the network (Ahuja 2000). According to the resource-based view, firms that have more interorganizational relationships can access resources more readily and therefore enjoy an enhanced performance (Love and Roper 2001). On the basis of this argument, we hypothesize that the larger the number of direct interorganizational relationships a firm has, the greater its performance.

Dyadic characteristics of a firm's interorganizational relationships determine a firm's level of organizational embeddedness as well. The importance of dyadic characteristics is based on the fact that not all ties are equally important. A successful interorganizational relationship, underpinned by stable, intense, and frequent interactions, facilitates collaborative behavior and the exchange of knowledge (Ahuja 2000). In other words, strong ties are the bedrock of mutual resource sharing and so by extension are a determining factor in increasing the performance of firms, especially of innovative firms (Krackhardt 1992).

Furthermore, to exchange tacit resources, both parties have to understand them and know how to use them. In other words, a certain level of technological proximity, defined as "the level of overlap of the knowledge bases of collaborating actors" (Knoben and Oerlemans 2006, 80), is required. The importance of technological proximity for the performance of firms lies in the fact that firms must have comparable knowledge bases to be able to recognize the opportunities that collaboration offers, but different knowledge bases to use the exchanged resources creatively (Wuyts, Colombo, Dutta, and Nooteboom 2005).

Territorial Embeddedness

Another important characteristic of a firm's overall network that has been described extensively in the literature is the level of geographic localization of a firm's interorganizational relationships. It is often argued that the larger the spatial distance between actors, the more difficult it is to transfer knowledge, especially tacit knowledge, and/or to maintain interorganizational relationships successfully (Gallaud and Torre 2004; Gertler 2003). By extension, more localized interorganizational relationships facilitate access to unique external resources better than do nonlocalized ones.

However, the role of territorial embeddedness has been highly debated in the literature. Some researchers have questioned if spatial proximity is a prerequisite for successful collaboration, and some have proposed the possibility that other relational characteristics are more important (Breschi and Lissoni 2001). Furthermore, organizational embeddedness and territorial embeddedness are often fused into a single concept (Oinas 2000), which could lead to an overemphasis on the importance of geographic distances (Hess 2004). Finally, some have argued that high levels of territorial embeddedness could lead to a lock-in situation in which firms are not open to opportunities and resources

outside their own region (Grabher 1993; Taylor and Asheim 2001). Notwithstanding such counterarguments, we suggest that there is a positive correlation between territorial embeddedness and the performance of firms. By disentangling organizational and territorial embeddedness and taking relational characteristics into account that could negate the need for geographic proximity, we isolated the effect, if any, of territorial embeddedness.

The Geographic Position of the Firm

The characteristics of the geographic region in which a firm is located can act as a resource that provides a firm with a competitive advantage (Beaudry and Breschi 2003; Wiewel and Hunter 1985). The spatial concentration of economic activities leads to advantages for firms that can be obtained only by being part of that spatial concentration. Such advantages can be grouped in different ways, but usually localization economies, also called Marshall-Arrow-Romer externalities, and urbanization economies, also called Jacobs externalities, are distinguished (Feldman 1999). Moreover, firms that are located in regions with many knowledge-intensive organizations could potentially draw on knowledge spillovers. In essence, firms could conceivably tap into the knowledge base that is available in their geographic environment and, in doing so, could enhance their innovative performance (Beaudry and Breschi 2003).

There are also downsides to being located in an agglomeration, related mostly to the effects of local competition. When firms agglomerate in space, competition for land increases, which is likely to drive up the cost of land and create a centrifugal force in the region (Flyer and Shaver 2003). When there is an agglomeration of firms producing similar products, the market will become saturated at some point, and new establishments will find it difficult to gain a foothold (Sohn 2004). Such potential downsides of spatial agglomerations notwithstanding, we hypothesized that they have an overall positive effect on a firm's performance. Nevertheless, we took into account the existence of these downsides in interpreting the results.

Consequences of Relocation

All of the hypotheses that we have derived so far view the characteristics of a firm's geographic environment and its level of organizational and territorial embeddedness as a given and thus do not take the effects of relocation into account. However, a relocation would most likely bring about changes in the phenomena we described. First, there is the cost of the physical move itself. Although this is a onetime cost that is unlikely to influence a firm's performance in the long term, it can still be a significant expense. Of longer-lasting impact is the loss of path-dependent, location-specific investments and sunk costs (Arthur 1994; Arthur, Ermolieve, and Kaniovsky 1987). The loss of these investments, analogous to site-specific investments in transaction cost theory, implies the loss of access to localized resources, which is likely to have a net negative impact on the performance of the relocating firm as the revenues associated with them are lost while investments at the new location are yet to be made.

Moreover, any benefits accruing to a firm from its level of organizational embeddedness are also likely to be disrupted, since the exchange of knowledge is facilitated by stable interorganizational relationships (Ahuja 2000). Relocating is likely to have an impact on the degree of organizational stability, and thus on these relationships, and ultimately, will be reflected in the firm's performance. In this respect, there is evidence in the literature that sudden shocks (i.e., critical events) can severely hamper the functioning of interorganizational relationships and, as a result, affect the firm's performance (Knoben, Oerlemans, and Rutten 2006). It is plausible that relocation can be just such a shock. Managers have categorized relocation as a critical event, with which they have generally

had little or no experience (Isabella 1990). It should be emphasized that the disruptive effect of relocation on a firm's level of organizational embeddedness is based on organizational instability. This instability is in essence aspatial but is triggered by the relocation of the firm.

A disruption in a firm's level of territorial embeddedness is a direct result of the relocation itself. The extent of the impact of a move on territorial embeddedness depends on distance but also on direction, that is, whether the firm will be closer to, or farther away from, key partners after the relocation. In either case, any move implies a loss of access to at least some of the resources that were available at the previous location.

Such negative effects are likely to subside over time as the firm becomes established at its new location and stability returns. Moreover, a period of stability should lead to a recovery of the level of organizational embeddedness and allow the firm to initiate new interorganizational relationships and to establish territorial embeddedness at its new location so that it taps into the available agglomeration economies and local spillovers, thereby gaining access to new critical resources. Finally, according to location theory, the fit of the resource requirements at the new location should be better than at the old location, leading to better performance in the long run.

A number of characteristics of the relocation itself are likely to influence the relationship between a firm's relocation and performance. The geographic distance between the old and new locations is of importance. Greater distances are likely to have bigger disruptive effects on both organizational and territorial embeddedness. As far as territorial embeddedness is concerned, the greater the distance, the more difficult it will be to transfer tacit knowledge between the firm and its partners at the former location, resulting in lower levels of performance. Finally, a long-distance move may be expected to result in more-prolonged instability for the organization and may have a greater impact on organizational embeddedness. This possibility was corroborated by earlier research, based on interviews with managers, that concluded that "longer distance and larger scale moves appeared to have the most disruptive force" (Carter 1999, 24). The fact that even a small-scale move can affect a firm's performance notwithstanding, it appears likely that the greater the distance of the move, the larger the effect on the firm's performance.

As we said earlier, the direction of the move is also likely to be important. Differences between the region of origin and the region of destination matter in terms of the available spatial externalities. A firm could, for example, benefit from relocating from a rural region with few spatial externalities to a more urbanized region where positive spatial externalities are more abundant. Conversely, firms that move from an urban to a rural setting may suffer from a loss of spatial externalities that could severely affect their performance. A similar argument holds for differences in levels of localization and the availability of knowledge spillovers between regions.[3]

Finally, firms that move toward their main partners would be expected to experience easier access to the tacit resources of their partners through increased face-to-face contacts. In contrast, firms that relocate away from their main partners are likely to find that their access to the tacit resources of partners is hampered.

Besides the characteristics of the move itself, the level of organizational and territorial embeddedness of the firm is likely to have an impact on the relationship between a firm's relocation and performance. Because interorganizational relationships are facili-

[3] Some researchers have questioned the validity of such regional differences in small countries, notably the Netherlands. Nevertheless, ample empirical research has indicated that even in small countries, regional differences have an influence on the innovative performance of firms (Beugelsdijk 2007; Boschma and Weterings 2005; van Oort 2002).

tated by stability (organizational embeddedness) and geographic proximity (territorial embeddedness), the potential impact of geographic instability as a result of relocation is expected to be stronger for firms with higher levels of organizational and/or territorial embeddedness.

However, several researchers (Amin and Cohendet 2005; Breschi and Lisoni 2001a; Gertler 2003; Owen-Smith and Powell 2004), working in the fields of economic geography and evolutionary and neoinstitutional theory, have argued that the need for geographic proximity and stability in interorganizational relationships can be negated by high levels of organizational proximity, defined as "the set of routines—explicit or implicit—which allows coordination without having to define beforehand how to do so. The set of routines incorporates organizational structure, organizational culture, performance measurements systems, language and so on" (Knoben and Oerlemans 2006, 80). The reasoning behind this view of the importance of organizational proximity is that interorganizational relationships are more efficient and lead to better results when the organizational context of both partners is similar because that similarity facilitates mutual understanding and trust building. These characteristics may negate the need for geographic proximity in interorganizational relationships (Knoben and Oerlemans forthcoming). If this reasoning holds, high levels of organizational proximity can offset the negative impact of relocation on firms that (1) have high levels of geographic proximity with their main partners, (2) have strong ties, and/or (3) make long-distance relocations.

Measurements

Firm Performance

Firm performance is a multidimensional concept by nature, often divided into economic and innovative performance (Damanpour and Evan 1984). However, both categories of performance consist of several more-specific types of performance. Subsequently, we present the indicators for innovative and economic performance that we used in our research.

Indicators of innovative performance. Research and development (R&D) expenditures and patents are commonly used indicators of a firm's innovative performance (Hagedoorn and Cloodt 2003). Both measures suffer from the same drawback: they tend to underestimate innovation in small firms and service firms (Brouwer and Kleinknecht 1996). Since many relocating firms are relatively small and/or operate in service sectors (van Dijk and Pellenbarg 2000), the use of these indicators as a measure of innovative performance is problematic.

The proportion of sales that is obtained with innovative products or services is a more reliable measure of innovative performance in the context of this research (Brouwer and Kleinknecht 1996). The clear advantage of this measure of innovative outcomes is that it captures the fit between product innovation and market demand and thus is closer to the generally accepted definition of innovation as the introduction of new products or services.

We also took into account a second dimension of innovative performance: the level of newness of the innovation. Research has shown that this distinction is important because different types of innovative performance are influenced differently by a firm's organizational and territorial embeddedness (e.g., Oerlemans, Meeus, and Boekema 1998).

We used measures of self-reported innovation that were developed for the Community Innovation Survey (CIS) to accommodate the demands posed by a reliable measurement of innovative performance for small firms and service firms. Research

has shown that the subjective indicators of innovative performance are as reliable as the objective indicators just mentioned (Hagedoorn and Cloodt 2003). Managers were asked whether or not their firms had introduced new or improved products, services, or processes in the previous two years. The novelty of the innovations was determined by whether products or services were improved versions of existing ones or were new for the firm or to the market. We determined the impact of the innovation by asking what percentage of the firm's turnover was generated by products and services within each category.

Indicators of economic performance. There are many different ways to assess the economic performance of firms, and a considerable number of them stem from the literature on capital markets. The most striking downside of these measures is that their computation requires detailed information that is often available only for large, publicly traded firms and often only for these organizations as a whole. Therefore, these measures were not applicable to our research.

As measures of the economic performance of firms, we used a firm's growth in employment in full-time equivalents (FTE) and computed a firm's profitability as the average profit per full-time employee.[4] Growth in FTE is an indicator of the physical growth of the firm that we took into account, since physical growth is often one of the driving forces behind a firm's spatial mobility (van Dijk and Pellenbarg 2000). We took a firm's profitability into account because relocating entails significant moving costs that are likely to affect a firm's profitability. Including this indicator allowed us to identify any effects of relocation on the financial health of a firm in the short term.

Independent Variables

The strength of a firm's internal knowledge base is measured by asking respondents the percentage of the total turnover that a firm used for R&D. Because, as we noted earlier, small firms are less likely to have formal R&D activities, we used as a proxy the percentage of employees with advanced education, that is, who have degrees from polytechnic institutes or universities. This operationalization reflects the fact that the strength of the internal knowledge base of a firm is predominantly shown by the unique knowledge resources that the firm possesses.

Our indicator of the structural dimension of a firm's level of organizational embeddedness is the self-reported number of knowledge-intensive interorganizational relationships that it maintains. We focused on knowledge-intensive interorganizational relationships because they have the largest impact on the behavior and performance of firms (Ahuja 2000).

Subsequently, the respondents were asked several questions about the most important interorganizational relationship of their firms, so we could obtain information about the characteristics of the relationships of the firm. We chose this approach because the survey would have been excessively unwieldy had details on all of the innovative relationships of each of the firms been included. Moreover, when respondents are asked about the characteristics of more than one relationship, the problem of missing data becomes large. We adopted the approach of focusing on the main knowledge-intensive interorganizational relationship of the firms from the CIS.

[4] We also looked at measures of the growth in turnover. However, these measures correlated highly with the growth in the number of employees, which indicates that they represent a similar dimension of performance. We also used a factor score incorporating both measures of performance that led to almost identical results but is harder to interpret. Therefore, in this article, we focus on the results for the growth in employees.

Table 2

Results of Factor Analyses

	Factor		
Variable	Organizational Proximity	Technological Proximity	Strength of Ties
Cultural similarity	0.859		
Structural similarity	0.848		
Relational similarity	0.453		
Technology overlap		0.875	
Knowledge overlap		0.875	
Scope of interorganizational relationships			0.708
Contact frequency			0.706
Face-to-face contacts			0.611
Level of specific investments			0.578
Kaiser-Meyer-Olkin measure	0.541	0.500	0.672
Test of sphericity	47.075	36.348	30.793
Significance	0.000	0.000	0.000
% of variance explained	55.38	76.57	49.99

Source: Adapted from Knoben and Oerlemans (forthcoming), Table 3, and Table 4.

We measured the strength of the main interorganizational relationship of the firms by asking the respondents to indicate, on a 5-point Likert scale, the extent to which the relationship with their main partner (1) had a broad scope, (2) had high levels of formal control, and (3) required high levels of relation-specific investments. Moreover, questions about the duration of the relationship with their main partner (measured in months) and the frequency of face-to-face contacts with this partner were included. These questions correspond to the dimensions of the strength of ties proposed by Gilsing and Nooteboom (2005).[5]

These items were analyzed by factor analysis (see Table 2). It became clear that neither the duration of a tie nor the level of formal control load high on a single factor with the other indicators of tie strength. The remaining items load on a second factor that describes the intensity of the interaction between two actors, which fits the theoretical concept of the strength of ties. Therefore, we dropped the first two items from the final analyses rather than include them as separate dimensions of the concept.

The level of organizational proximity between the focal firm and its main partner was measured by asking the respondents to indicate, on a 5-point Likert scale, the extent to which the main partner (1) was using the same third-party partners, (2) shared the same organizational norms and values, and (3) had the same organizational structure. A similar method was used to measure the level of technological proximity between the focal firm and its main partner. In this case, the respondents were asked to react to statements concerning the level of technological overlap and the level of knowledge similarity between the firm and its main partner. The dimensions for both of these concepts were analyzed by factor analysis (see Table 2), from which it became clear that the level of organiza-

[5] The level of trust is commonly used as a dimension of the strength of ties as well (Gilsing and Nooteboom 2005). However, items that aimed to measure the level of trust between the responding firm and its main knowledge-intensive interorganizational relationship did not have any discriminating value (see also Knoben and Oerlemans forthcoming). As a result, this dimension was dropped from our analysis.

tional proximity and the level of technological proximity between a firm and its main partner each form a single factor.

The level of territorial embeddedness was measured by asking the respondents the six-digit postal code of their main partner's location. We knew the postal codes of the respondents themselves and were therefore able to determine the distance and travel time between each focal firm and its main partner.

Data on the geographic environment of the responding firms were not gathered through the questionnaire but were obtained from the Dutch Central Bureau of Statistics. Data on regional levels of urbanization and localization are available at the level of the municipality. For urbanization, they range from 1 (rural) to 5 (highly urbanized). In the case of localization, they reflect the percentage of firms in the municipality that are active in the business services sector. We also used data at the municipal level to measure the R&D intensity of the regions in which the focal firms were located. The employed database gives the relative share of total wages spent on R&D per municipality (see van Oort 2002 for an elaborate description of this database).[6]

Information on the relocation behavior of firms was obtained from the questionnaire. The respondents were asked to map the spatial history of their firms' which we used to identify (previous) relocations. Data were collected on the year of relocation or relocations, with the starting point and the destination of each move measured by six-digit postal codes. From that information, the time frame, geographic distance, and direction of the relocation (in terms of urbanization, localization, R&D intensity, and proximity to the main partner) could be determined.

The size of a firm and whether or not it was part of a multisite firm were included in the analysis as control variables. The size of a firm was measured by the natural logarithm of the number of full-time employees. A dummy variable was given the value of 1 if the firm was part of a multisite firm, which was the case for 19 percent of the focal firms. It was included as a control variable because it is likely that the impact of relocation is different for a stand-alone firm than for one that is part of a multisite firm.

Methodology

Data Collection and Nonresponse Analysis

We mailed questionnaires to all Dutch automation services firms with five or more full-time employees. We decided on this approach because there are large differences in the propensity to relocate between sectors. To reduce heterogeneity resulting from this approach, we decided to focus on a single branch of industry. Several different types of economic activities are carried out within this sector, the main ones being hardware consultancy, production and implementation of software and web sites, automation of production processes, repair and maintenance of computers and other office appliances, network maintenance, and electronic security. The sector is comprised of about 17,500 firms, roughly 2.5 percent of all firms in the Netherlands, employing some 123,800 persons, 1.5 percent of the total national employment. Taking 2001 as the base year, we found that the number of jobs declined by 16 percent in 2001–2003, but increased from 2003 to 2005. Still, the number of jobs in 2005 was 11 percent lower than in 2001. There was a strong growth in sales, especially between 2004 and 2006. In 2000–2004, sales

[6] Data on other regional characteristics, including the level of congestion, the price of land, the availability of highly skilled labor, and the gross regional product are also available. However, these variables correlate problematically high with the geographic variables that we selected and were not included in the analysis so as to prevent multicollinearity problems.

increased 6 percent, and in 2004–2006, sales increased 22 percent (all data were obtained from the Dutch Central Bureau of Statistics).

We selected automation services because relocations of firms in this sector are relatively more common than in the manufacturing and wholesale sectors, and it is characterized by high levels of innovativeness, in both inputs and outputs. Almost 3 percent of the total value added is spent on innovative activities, as opposed to 1 percent on average in the other service sectors. Moreover, 52 percent of all firms reported that they had successfully innovated in the previous two years, as opposed to 23 percent of the firms, on average, in the other service sectors. The magnitude of innovative collaboration is comparable to that in the other service sectors, 32 percent for automation services and an average of 34 percent for the other service sectors. It is interesting that firms in the automation services sector focus almost exclusively on the domestic market. This was an important selection criterion for this research, since international relocations are likely to have different determinants and consequences than are intranational relocations. Within the Netherlands, however, firms in the automation services sector have a reputation for being relatively "footloose" (van Dijk and Pellenbarg 2000). If an effect of relocation on firms' performance could be found in this sector, this would be a strong test of our hypotheses.

The Dutch Chamber of Commerce gave us the addresses of all the selected firms. We eliminated firms without economic activities, subsidiaries sharing the same address, and duplicates, leaving 2,553 firms. We tested the questionnaire to ensure that the questions would be understood as intended and sent the questionnaires via the Dutch postal service.[7] Unfortunately, because of the limitations of the chamber of commerce database, no reliable names of contact persons were available. Therefore, we addressed each questionnaire to the "managing director" of the firm. Ultimately, we received usable questionnaires from 203 firms, a response rate of 8 percent. Similar response rates were obtained in two other microlevel studies. For example, the response rates in two comparable studies, by Oerlemans and Meeus (2005) and Rooks, Oerlemans, Buys, and Pretorius (2005), were 8 percent and 8.4 percent, respectively. In addition to the general downward trend in response rates, meta-analyses of response rates have suggested additional reasons. Baruch (1999) pointed out that surveys that are addressed to specific individuals have higher response rates than do those that are addressed to administrative positions, and Klassen and Jacobs (2001) noted that studies with small and medium-sized enterprises, which were predominantly sampled in this research, have lower response rates. In view of this situation, our 8-percent response rate is not exceptional.

Nevertheless, the response rate raises the possibility that the data may suffer from a sample bias. Therefore, we also performed a nonresponse analysis. We contacted the managers at 179 of the firms from which we did not receive a response, 130 of whom were willing to cooperate, a response rate of 73 percent. We asked each manager several key questions from the original survey about the presence of knowledge-intensive interorganizational relationships, about whether their firms performed any innovative activities, and about the size of the firms, a variable that is likely to contain bias. Finally, we gathered data on the firms' performance (the dependent variable). The data obtained from the follow-up telephone interviews with the 130 managers allowed for a detailed comparison of the respondents and nonrespondents to the questionnaire and provided valuable information on the representativeness of the data (see Table 3). For several other vari-

[7] We also conducted exploratory interviews with managers from several firms in the sample. These interviews greatly helped us to get a feel for the context of the research and an understanding of how the managers dealt with the consequences of relocation.

Table 3

Nonresponse Analysis

Variable	Respondents	Nonrespondents	Difference	Significance
Size of the firm				
Mean	23.5	27.6	4.1	0.19[a]
Presence of interorganizational relationships				
Mean	56%	51%	–5%	0.29[b]
Presence of innovative activities				
Mean	84%	79%	–5%	0.36[b]
	Respondents	Total Sample	Difference	Significance
Spatial distribution (province)				
Drenthe	1.0%	1.4%	–0.4%	
Flevoland	2.5%	2.7%	–0.2%	
Friesland	2.0%	1.6%	0.4%	
Gelderland	13.4%	11.6%	1.8%	
Groningen	1.5%	2.3%	–0.8%	
Limburg	5.5%	3.5%	2.0%	0.18[c]
Noord-Brabant	20.9%	14.1%	6.8%	
Noord-Holland	14.4%	20.6%	–6.2%	
Overijssel	5.0%	4.6%	0.4%	
Utrecht	10.9%	13.0%	–2.1%	
Zeeland	0.5%	0.6%	–0.1%	
Zuid-Holland	22.4%	24.1%	–1.7%	
Relocation behavior				
% Movers (past two years)	23.9	23.2	–0.7	0.82[c]
% Movers (past five years)	40.8	39.3	–1.5	0.66[c]

Source: Partly adapted from Knoben and Oerlemans (forthcoming), Table 1, and Table 2.

[a] *t*-test.

[b] Phi-test.

[c] Chi-square test.

ables, the questionnaire respondents could be compared to the entire population of firms in automation services, since these variables are available in the chamber of commerce database (see Table 3).

Table 3 shows that there are no statistically significant differences in the variables between the questionnaire respondents and the nonrespondents who were interviewed by telephone. There are also no statistically significant differences between the questionnaire respondents and the population as a whole. Both the spatial distribution and the past relocation behavior of the respondents' firms seems to be representative of the population as a whole. We conclude, then, that there are no structural differences between the respondents and the nonrespondents and hence no sample bias.

Descriptive statistics on all of the variables and their partial correlations are presented in Table 4. The partial correlations show the absence of multicollinearity. The highest partial correlation is 0.66 (level of urbanization and level of localization), which is not problematic. These correlations also reveal that there are only weak correlations among the different performance indicators. This finding justified our use of each indicator as a separate dependent variable, rather than constructing composite performance indices of them. However, it does not imply that the different performance measurements do not

Table 4

Descriptive Statistics

Number	Variable	Descriptives		Partial Correlations (Correlations with $p < 0.05$ displayed in bold)										
		Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11
1	Employee growth	0.18	0.57	—										
2	Profitability	8.46	14.80	0.06	—									
3	Improved products	21.15	21.53	0.10	0.02	—								
4	Products new to firm	25.87	27.68	**0.17**	0.03	–0.03	—							
5	Products new to market	0.53	0.50	0.12	0.00	**0.29**	**0.33**	—						
6	R&D intensity	14.96	19.36	0.03	–0.08	**0.16**	**0.39**	**0.41**	—					
7	% of highly educated personnel	63.72	31.56	0.11	0.15	**0.20**	**0.15**	**0.26**	**0.33**	—				
8	Number of interorganizational relationships (IORs)	1.24	1.70	0.06	0.02	**0.24**	0.02	**0.25**	**0.21**	**0.23**	—			
9	IOR localization	0.35	0.48	**0.18**	–0.05	0.09	0.06	**0.22**	**0.15**	0.11	**0.40**	—		
10	Technological proximity	2.14	0.75	–0.02	–0.05	**0.18**	0.04	0.11	0.04	–0.02	–0.01	–0.06	—	
11	Strength of ties	0.00	1.00	–0.01	0.04	0.18	0.15	0.06	–0.12	–0.06	**0.23**	0.14	–0.06	—
12	Level of urbanization of region	2.53	1.18	0.04	–0.13	–0.11	0.00	**–0.14**	0.03	–0.09	–0.07	–0.10	–0.07	–0.17
13	Level of localization of region	0.23	0.06	–0.05	0.09	0.05	–0.08	0.01	–0.10	0.00	–0.02	0.05	0.11	0.13
14	Level of R&D intensity of region	132.84	135.84	0.00	–0.09	0.09	–0.11	–0.06	–0.07	0.03	0.04	–0.04	0.12	0.04
15	Relocation year 1	0.15	0.36	0.06	–0.13	0.06	0.06	0.08	0.10	0.02	–0.09	0.10	0.04	–0.06
16	Relocation year 2	0.09	0.29	**0.17**	0.03	0.04	0.03	–0.04	0.05	0.05	**0.14**	0.08	–0.05	0.05
17	Relocation year 3	0.05	0.22	–0.03	–0.03	0.01	0.01	0.08	0.11	0.08	0.06	0.02	0.04	–0.01
18	Relocation year 4	0.07	0.26	–0.09	0.12	–0.03	–0.09	0.07	0.03	–0.07	0.05	**0.14**	0.10	–0.01
19	Relocation year 5	0.20	0.40	–0.03	0.00	–0.11	0.11	–0.01	–0.10	0.02	–0.03	0.02	–0.07	0.05
20	Distance of relocation	12.08	18.80	–0.03	**0.23**	–0.14	–0.02	0.02	–0.06	0.03	–0.05	–0.01	0.01	0.06
21	Direction: urbanization	0.23	0.95	0.01	0.02	**–0.20**	–0.08	–0.17	–0.06	–0.10	**–0.19**	**–0.24**	–0.11	–0.14
22	Direction: localization	–0.75	4.59	–0.14	0.02	0.10	–0.05	0.07	–0.08	–0.07	0.09	**0.18**	0.16	0.11
23	Direction: R&D intensity	–1.70	72.33	–0.04	0.03	0.07	–0.04	0.12	–0.12	–0.01	0.03	0.03	0.17	0.04
24	Direction: toward the main partner	–0.06	0.52	0.14	0.03	0.05	0.03	0.00	–0.01	–0.01	**–0.17**	–0.12	0.01	–0.04
25	Firm size (ln)	2.55	1.00	–0.03	0.07	0.12	–0.13	0.11	**–0.15**	–0.03	**0.22**	–0.11	**0.15**	0.12
26	Multisite firm	0.19	0.39	–0.09	–0.09	–0.04	–0.07	–0.02	–0.07	–0.04	0.12	–0.02	0.12	0.16

(continued on next page)

Table 4

Descriptive Statistics (continued)

		Partial Correlations (Correlations with $p < 0.05$ displayed in bold)													
Number	Variable	12	13	14	15	16	17	18	19	20	21	22	23	24	25
12	Level of urbanization of region	—													
13	Level of localization of region	**0.66**	—												
14	Level of R&D intensity of region	–0.13	**0.27**	—											
15	Relocation year 1	–0.06	0.09	–0.02	—										
16	Relocation year 2	–0.04	0.01	–0.01	–0.13	—									
17	Relocation year 3	0.03	0.01	0.07	–0.09	–0.07	—								
18	Relocation year 4	0.00	–0.05	0.01	–0.12	–0.09	–0.06	—							
19	Relocation year 5	–0.01	0.04	0.04	**–0.21**	**–0.16**	–0.11	**–0.14**	—						
20	Distance of relocation	0.09	0.01	–0.12	0.15	–0.05	0.05	–0.13	–0.10	—					
21	Direction: urbanization	**0.46**	**–0.27**	0.01	–0.08	–0.01	0.15	–0.04	–0.11	0.03	—				
22	Direction: localization	**–0.32**	**0.33**	–0.10	–0.08	0.04	–0.03	–0.01	0.14	0.11	**–0.65**	—			
23	Direction: R&D intensity	–0.08	–0.01	**0.30**	–0.17	–0.16	**0.21**	0.04	0.12	0.01	–0.17	0.13	—		
24	Direction: toward the main partner	–0.01	–0.05	0.08	0.17	0.00	–0.14	–0.01	–0.06	–0.08	–0.04	**–0.20**	0.11	—	
25	Firm size (ln)	**–0.18**	**0.18**	0.04	–0.06	–0.10	0.06	0.05	**0.15**	–0.01	0.13	–0.09	0.07	0.04	—
26	Multisite firm	–0.08	0.11	0.00	–0.03	0.02	0.00	–0.04	0.04	**0.20**	–0.05	–0.02	0.09	0.17	**0.32**

influence one another at all, since there might be time lags in the relationship between different dimensions of a firm's performance.

Methodology

Since the list of potentially important independent variables was long and the number of observations was limited, a systematic model-building approach was necessary. In such cases, a stepwise regression procedure is the most applicable method (McClave, Benson, and Sincich 1998). The result of this procedure is a model that includes only statistically significant variables. Even though the procedure eliminates the problem of selecting independent variables, it has two drawbacks. First, since a stepwise regression procedure uses only the sample estimates of the true model coefficients to select which variables are significant, the probability of both Type I and Type II errors is higher than with other regression procedures. Second, stepwise regression does not take into account any higher-order interaction terms. The second drawback can be partly mitigated by manually introducing these interaction terms on the basis of theoretical expectations, but doing so lengthens the list of potentially interesting independent variables even further. The first drawback, however, is inherent in the procedure and should be weighted against the benefit of a systematic model-selection procedure. Notwithstanding these drawbacks, earlier studies on the performance of firms have employed the same procedure (McClave, Benson, and Sincich 1998). Moreover, the use of a stepwise procedure leads to the inclusion of only the most important effects in the final model, thereby providing a much more conservative test of the proposed hypotheses than does the sequential testing of separate models. Therefore, a stepwise procedure appeared to be the best method of analysis in our case. We used an ordinary least squares regression for all performance indicators, except for whether or not the firm sold products that were new to the markets as a whole. For this categorical variable, we used a binary logistic regression.

All of the models were checked for heteroskedasticity, which is often a problem in cross-sectional research, with White's test for heteroskedasticity. In all of the models in which this test yielded significant results, White's heteroskedasticity-consistent standard errors and covariances were used. In addition to the bivariate correlations reported in Table 4, the variance inflation factors of all coefficients were analyzed to ensure that no higher-order multicollinearity problems occurred, which turned out not to be the case.

Results

The results of the analyses described in the fourth section are presented in Tables 5 and 6. We estimated 10 models. Table 5 contains one model for each performance indicator, based on all responding firms (models 1–5), whereas Table 6 contains one model for each performance indicator for a subset of firms that have at least one knowledge-intensive interorganizational relationship (models 6–10). The separate estimations of models 6–10 were necessary to allow for the effects of the relational variables proposed in the theoretical section. Because firms without any direct knowledge-intensive interorganizational relationships do not, by definition, score on these variables, we excluded them from this part of the analysis.

The results show, not surprisingly given the stepwise regression procedure, that all estimated models are highly significant. On the whole, the findings from Table 5 are consistent with those presented in Table 6 in terms of the direction of the signs. However, the coefficients for the subsample of firms with one or more interorganizational relationships (see Table 6) are higher. This result indicates that the impact (both positive

Table 5

Regression Results: Whole Sample

	Economic Performance		Innovative Performance		
	Employee Growth	Profitability	Improved Products	New to Firm	New to Market
	Model 1	Model 2	Model 3	Model 4	Model 5[a]
Internal knowledge base					
R&D intensity of firm		–0.167**		0.423***	0.084***
% Highly educated personnel	0.126*	0.187**	0.156**		0.012**
Organizational embeddedness					
Number of interorganizational relationships			0.232***		
Territorial embeddedness					
IOR localization	0.143**				0.896**
Geographical environment					
Level of urbanization of region		0.136*			
Firm relocation					
Year 1		–0.125*			
Year 1 × distance	0.242*				
Year 1 × direction urbanization	–0.329**				
Year 1 × direction localization				–0.161**	
Year 1 × direction R&D intensity				0.119*	
Year 2	0.219***				
Year 2 × distance				0.122**	
Year 2 × direction urbanization					–0.957**
Year 2 × direction localization					0.386**
Year 2 × direction R&D intensity	0.141**				0.048**
Year 2 × multisite firm			–0.127***		–0.390**
Year 4 × distance		0.228***			
Year 5			–0.125**	0.160***	
Year 5 × distance		0.207**			
Year 5 × direction urbanization		–0.232***		0.129**	
Year 5 × direction localization				0.163***	
Year 5 × direction R&D intensity		–0.284***			
Year 5 × multisite firm		–0.200***			
Control variables					
Size (ln)					0.513***
Model indicators					
N	201	141	201	201	201
Significance	0.000	0.000	0.000	0.000	0.000
R-squared	24.2%	29.0%	23.8%	35.0%	50.5%[b]
White's test for heteroskedasticity	0.000[c]	0.272	0.004[c]	0.170	NA

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[a] Binary logistic regression.

[b] Nagelkerke's pseudo *R*-square.

[c] White's heteroskedasticity-consistent standard errors and covariance used to correct for heteroskedasticity.

Note: Excluded variables: Multisite firm, R&D intensity of region, Level of localization of region, Year 1 × multisite firm, Year 3, Year 3 × distance, Year 3 × direction urbanization, Year 3 × direction R&D intensity, Year 3 × direction localization, Year 3 × multisite firm, Year 4, Year 4 × distance, Year 4 × direction urbanization, Year 4 × direction R&D intensity, Year 4 × direction localization, Year 4 × multisite firm.

and negative) of relocation is indeed larger for firms with one or more interorganizational relationships, which is in line with hypothesis 12. We now discuss the results for each category of variables.

Table 6

Regression Results: Subsample of Firms with One or More Interorganizational Relationships (IORs)

	Economic Performance		Innovative Performance		
	Employee Growth	Profitability	Improved Products	New to Firm	New to Market
	Model 6	Model 7	Model 8	Model 9	Model 10[a]
Internal knowledge base					
R&D intensity of firm				0.388***	0.056***
% Highly educated personnel	0.163*				0.020***
Organizational embeddedness					
Number of IORs			0.240***	–0.198**	
IOR × technological proximity			0.238***		
IOR × strength of ties			0.172*	0.166*	
Geographic environment					
Level of localization of region		0.198**			
R&D intensity of region			0.147*		
Firm relocation					
Year 1 × distance	0.369**				
Year 1 × direction urbanization	–0.521**				
Year 1 × direction R&D intensity	0.580*				
Year 1 × IOR localization		–0.182**			
Year 1 × direction partners				0.191**	
Year 1 × direction localization	–0.629**				
Year 1 × multisite firm	–0.277**				
Year 2 × distance	–0.277**			0.211**	–0.153**
Year 2 × strength of ties	–0.182**				
Year 2 × direction R&D intensity					0.613**
Year 2 × direction partners			0.166*		
Year 2 × organizational proximity	0.350**				0.850**
Year 4 × distance		0.317***			
Year 5				0.152**	
Year 5 × distance		0.385***			
Year 5 × strength of ties		0.246***			
Year 5 × direction urbanization		–0.498***			
Year 5 × direction localization				0.181**	
Year 5 × direction R&D intensity		–0.250**			0.067**
Year 5 × multisite firm		–0.304***			
Control variables					
Size (ln)					0.598**
Model indicators					
N	112	76	112	112	112
Significance	0.000	0.000	0.000	0.000	0.000
R-squared	53.1%	46.2%	16.5%	28.1%	37.3%[b]
White's test for heteroskedasticity	0.000[c]	0.144	0.153	0.736	NA

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[a] Binary logistic regression.

[b] Nagelkerke's pseudo *R*-square.

[c] White's heteroskedasticity-consistent standard errors and covariance used to correct for heteroskedasticity.

Note: Excluded variables: Multisite firm, IOR localization, IOR × technological proximity squared, Level of urbanization of region, Year 1, Year 1 × organizational proximity, Year 2, Year 2 × direction urbanization, Year 2 × direction localization, Year 2 × IOR localization, Year 2 × multisite firm, Year 3, Year 3 × distance, Year 3 × direction urbanization, 3 year × direction R&D intensity, Year 3 × direction localization, Year 3 × IOR localization, Year 3 × direction partner, Year 3 × organizational proximity, Year 3 × tie strength, Year 3 × multisite firm, Year 4, Year 4 × direction urbanization, Year 4 × direction R&D intensity, Year 4 × direction localization, Year 4 × IOR localization, Year 4 × direction partner, Year 4 × organizational proximity, Year 4 × tie strength, Year 4 × multisite firm, Year 5 × IOR localization, Year 5 × organizational proximity, Year 5 × direction partner.

The Internal Resource Base

For both samples, the strength of a firm's internal resource base has consistent effects on the firm's performance. Firms with highly educated personnel have higher levels of employee growth and of innovative performance. Moreover, the R&D intensity of firms has a positive effect on the firms' innovative performance, especially when it comes to more radical forms of innovation. An interesting finding is that the R&D intensity of a firm has a negative effect on the firm's profitability, as seen in model 2. This finding may indicate that firms that spend considerably on R&D do not necessarily recover these expenditures through increased sales or higher profit margins. With the exception of profitability, however, these findings corroborate hypothesis 1 for all measures of a firm's performance.

Organizational Embeddedness

We got mixed results regarding the impact of organizational embeddedness on performance. On the one hand, the number of interorganizational relationships that a firm maintains is positively associated with incremental innovative performance for both samples. This finding implies that access to resources that are conducive to incremental innovations come from many different sources, but that it is not necessary for the sources to be localized. On the other hand, maintaining a large number of interorganizational relationships actually seems to be detrimental to the generation of products that are new to the firm (model 9). Since we found no effect on the other types of performance, hypothesis 2 is accepted for incremental innovative performance, but rejected for all other types of performance.

We found some support for the hypothesized role of the strength of ties. Strong ties are beneficial for the generation of improved products and for products that are new to the firm. Therefore, hypothesis 3 is accepted.

We found no support for the hypothesized role of technological proximity, even though there is a positive effect of technological proximity on incremental innovative performance (model 8). This effect does not decline at higher levels of technological proximity, as we predicted. This finding leads us to reject hypothesis 4 and implies that for incremental innovativeness, innovating firms need partners with knowledge as similar as possible.

Territorial Embeddedness

Both in terms of employee growth and radical innovations, the performance of a firm is positively influenced by a high degree of territorial embeddedness. The latter finding supports the idea that the transfer of tacit knowledge, which is assumed to be especially conducive to radical innovations, is fostered by geographic proximity. The former finding may indicate that firms that are embedded in local knowledge systems achieve, in general, better economic performance. However, we did not see these results when we analyzed the subsample of firms with one or more interorganizational relationships (Table 6), probably because focusing on a subset of firms with at least one interorganizational relationship implies a loss of variation on the territorial embeddedness scale. In sum, hypothesis 5 is partly confirmed.

Geographic Position

Contrary to the hypothesized effects, the characteristics of the region in which a firm is located play a relatively minor role in explaining the firm's performance. There is some weak evidence that firms in highly urbanized regions and in regions with high localiza-

tion levels have slightly higher profitability. This effect, however, is relatively weak and does not apply to any of the other performance indicators, leading to the rejection of hypotheses 6 and 7.

Knowledge spillovers, resulting from being located in a highly intensive R&D region, affect only marginally incremental innovative performance. We found no effects for the other performance indicators, so hypothesis 8 is rejected.

Consequences of Relocation

There are no indications that relocation as such has a negative impact on the performance of firms in the short run, with the exception of a small negative effect on the profitability of firms that most likely reflects the costs of the actual physical move. It should be noted that this effect holds only for firms with localized partners in the case of firms with interorganizational relationships. In the long run, however, relocation has a positive effect on employee growth and on the share of turnover generated by products that are new to the firm. Therefore, hypothesis 9a is rejected, whereas hypothesis 9b is confirmed.

The findings for the impact of the distance between the original location and the new location on a firm's performance are mixed. Firms that move over longer distances have more growth in terms of the number of employees in the first year at the new location, but this finding is likely to be due to a reverse causation effect, since firms that were not able to grow because of physical constraints at the old location grow as soon as they have the room to do so. Furthermore, for the subset of firms with one or more interorganizational relationships, we found that relocation over longer distances leads to a decline in employee growth two years after relocation. On a somewhat longer time horizon, the findings indicate that firms that relocate over longer distances show increased profitability after four years at the new location, indicating that relocations over a longer distance pay off for this performance measure in the long run. Finally, relocations over longer distances are positively associated with the percentage of sales that are generated by products that are new to the firms, but negatively associated with the generation of products that are new to the market. The latter finding is in line with the expectation that the transmission of tacit knowledge through interorganizational relationships, which is required for more radical types of innovation, is negatively influenced by instability. However, because we found no clear pattern in the data, we rejected hypothesis 10, despite the fact that it is clear that the distance of the relocation plays an important role.

Contrary to our expectations, firms that move toward more urbanized or more localized regions show decreased growth in the number of employees and in their profitability. This finding indicates that the downsides of spatial agglomerations (e.g., congestion and competition for qualified labor) outweigh the benefits that are associated with them. Another explanation may be that firms that perform well are less dependent on co-location with other firms and are therefore more likely to locate in rural and less localized areas (Alcacer 2006). Thus, there could be a reverse causation effect, in which well-performing firms "select" themselves to move to less urbanized and localized regions. Therefore, especially in the short term, these employment effects should be considered as correlations, rather than as strong causal effects.

The effects of moving to more urbanized regions or regions with higher levels of localization are mixed in terms of innovative performance. Firms that relocate to such regions make a larger percentage of their sales, in the long run, from products that are new to them. This finding is especially interesting because these characteristics have a negative impact on the profitability of a relocating firm, indicating that there might be a trade-off between "innovation conducive" and "profit conducive" regions. Relocating to more urbanized regions has a negative impact on the introduction of new products to the

market, whereas the effects of relocating to regions with a higher level of localization are positive. All in all, the effects are contrary to those we hypothesized in most cases, leading to the rejection of hypotheses 11a and 11b.

Relocating to a more R&D-intensive region has a positive effect on a firm's economic and innovative performance, except in terms of profitability in the long run. With this caveat in mind, hypothesis 11c is confirmed. Moreover, there is some evidence that relocating to a firm's main partners leads to an increase in innovative performance. Therefore, hypothesis 11d can be cautiously accepted.

As we said earlier, our findings show that firms with higher levels of organizational embeddedness are more susceptible to the disruptive effects of relocation in the short term. Although relocating firms with strong ties show a decline in employee growth two years after their relocation, there is a positive profitability effect in the long term. It seems that firms with strong ties pay a price at first, but that benefits follow later. This finding confirms arguments made by Boschma (2005), namely, that strong ties can also lead to organizational lock-in and interorganizational inertia. Breaking this inertia is costly in the short run, but beneficial in the long run (Powell, White, Koput, and Owen-Smith 2005). Therefore, hypotheses 12 and 13b are accepted.

However, there is weak evidence for the proposition that high levels of territorial embeddedness influence the effects of relocation on a firm's performance. Only the short-term profitability of relocating firms is influenced by the firms' level of territorial embeddedness. Therefore, hypothesis 13a is rejected.

We found, though, that in all cases in which either distance or the disruption of strong ties had a negative impact on firms' performance, the effect was negated by high levels of organizational proximity. This finding provides strong evidence for the hypothesis that organizational proximity indeed can reduce the need for stability in interorganizational relationships. Therefore, hypothesis 12c is accepted.

Finally, the results show that establishments that are part of a multisite firm benefit less from relocation than do their single-site counterparts, in terms of both economic and innovative performance. It could be argued that the impact of relocation on the performance of establishments that are part of multisite firms are, in the main, relatively inconsequential in contrast to the otherwise predominantly positive effects found for other firms.

Discussion and Conclusions

We set out to provide insights into the effects of relocation on the performance of firms, taking into account that firms are not atomistic actors but are geographically and organizationally embedded. We found that, in the medium and long term, most firms benefit from relocating. However, the analyses also showed that the general positive effect of relocation on a firm's performance is influenced heavily by the level of organizational embeddedness and the characteristics of the relocation (i.e., direction and distance). High levels of organizational embeddedness provide stationary firms with easy access to external resources and thereby lead to higher levels of performance (see the results for hypotheses 2 and 3). However, a high level of organizational embeddedness can be a liability if a firm relocates, especially for firms with many and/or strong interorganizational relationships (see the results for hypotheses 12 and 13b). These findings provide evidence that relocation is a critical event that can disrupt interorganizational relationships and, as a result, affect the performance of firms.

Another striking result is that the liability caused by higher levels of organizational embeddedness can be negated, in part, by higher levels of organizational proximity (hypoth-

esis 13c). Organizational proximity indeed seems to be a safeguard against the negative effects that go along with many and/or strong ties, and of relocating over greater distances. These findings may be seen as evidence that the characteristics of ties determine their vulnerability to external shocks.

Finally, it seems that relocation does not disrupt territorial embeddedness, a factor that is of importance especially to radical innovative performance. This finding could indicate that, as is sometimes suggested in the literature, geographic proximity plays a role only during the formation phase of interorganizational relationships (Gallaud and Torre 2005). Another explanation may be that the distances over which firms tend to relocate are not sufficiently large to interfere with the functioning of territorial embeddedness or that innovating firms that need crucial knowledge resources are able to tap into interregional knowledge flows simply because such resources are not acquired locally (Amin and Cohendet 2005). The findings regarding organizational and territorial embeddedness suggest that the biggest threat to the performance of relocating firms comes from the general instability that accompanies relocation, rather than from the actual change in geographic proximity to partners.

Combining insights on the effects of the environment on firms' performance and insights on firms' relocations into one theoretical model results in a nonatomistic and nonstationary perspective on the relationship between the spatial behavior of firms and firms' subsequent performance. This model stresses that firms are part of different relational spaces, both organizationally and territorially. Each firm has its own "stickiness" and thus experiences different effects when relocating. From a theoretical point of view, this finding means that it is fruitful to take a multidimensional approach to embeddedness in which insights from different scientific fields are combined. Moreover, the findings show that the effects of relocation on the performance of firms differ, depending on the indicators of performance. The main causes of these differences appear to be time lags in the influence of relocation on different dimensions of performance, rather than absolute differences in effects, even though there are some exceptions. Most of the effect on employee growth appears in the short term, whereas the effect on innovative performance takes place in the medium term. Finally, effects on profitability become visible only in the long run. These findings support the notion that multiple performance indicators must be taken into account, since to focus on one performance indicator alone would conceal the diverse effects that relocating firms experience.

Even though our findings provide new and valuable insights, our study had some limitations. Two distinct types of selection bias may have influenced the results. First, as has been seen in earlier research, firms that have many interorganizational relationships and/or are highly dependent on their geographic position are less likely to relocate (Knoben and Oerlemans forthcoming; Romo and Schwartz 1995). This imposes a self-selection bias in the sense that firms that are most likely to suffer negative effects from relocating refrain from doing so. Second, only firms that have survived the relocation process were taken into account in this research. It may be, however, that many firms close down shortly after relocation. These firms would not appear in the chamber of commerce database and would therefore have been excluded from the sample. Both types of selection bias would lead to the conclusion that relocation has more positive effects on the performance of firms than is truly the case. Therefore, these biases could explain the lack of negative performance effects in the short term.

Moreover, the focus on a single sector within a single country limits the generalizability of the results. The lack of effect of relocation on territorial embeddedness may be peculiar to the automation services industry because firms in this industry are often intensive users of information and communication technology. The products that they work on are

often easily made digital and can therefore easily be exchanged over long distances. Analyzing data from sectors that do not have such characteristics (e.g., most manufacturing sectors) would likely have yielded different results. Another peculiarity of the sector that we investigated is the low impact of R&D intensity on performance. Formal R&D is underrepresented in small firms and service firms, which make up the bulk of the automation services sector. Therefore, data from a (manufacturing) sector with mainly large firms would likely have yielded different results. Finally, interorganizational relationships are a relatively common feature of automation services firms. Even though most sectors experience an increase in the prevalence of such relationships, the effect of these relationships on the behavior and performance of firms may be different in sectors in which they are still relatively scarce. Our expectations regarding all of these differences are the main argument for our use of a single-sector approach.

Even though there are no clear reasons why the findings should not apply to other countries, it seems plausible that there are some small-country peculiarities in the data. In particular, the lack of a negative impact of territorial embeddedness on the performance of relocating firms could be specific to small countries. It could be that the maximal relocation distance within small countries is simply not large enough to allow for the disruption of a firm's territorial embeddedness. When relocations in large countries are studied or international relocations are taken into account, a negative impact of territorial embeddedness on the performance of relocating firms may become visible. Moreover, when the findings are extrapolated to other geographic regions, it should be taken into account that the geographic scale at which regional characteristics have an impact on firm performance are likely to be different for other, especially larger, countries. For example, much of the research on this topic in the Netherlands has been at the municipal level, whereas studies in the United States have often used the state as the level of analysis. These differences in geographic scale are also highly relevant when studying the effects of relocations on firms because they influence the geographic level at which the direction of a relocation should be studied.

To correct for these limitations, longitudinal and/or cross sectoral data would have to be collected from different countries, which seems to be the logical next step in this field of research. However, by analyzing data on establishments, focusing on several types of performance indicators, and including firms' geographic environment and organizational embeddedness, we have dealt with several limitations of previous analyses, thereby providing a solid foundation for future longitudinal and cross-sectoral research.

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